# PowerBOT: A Portable Power Mobility Training Device

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## *Background/Objective*

Independent mobility plays a crucial role in developing a child's cognitive, social and emotional abilities. Babies are projected to take their first steps somewhere between the ages of 9-12 months, and power wheelchairs currently exist for children as young as 18 months old. Thus, the average child with impaired mobility's development could be delayed 6 months or more. Traditional power wheelchair training is needed for children younger than school age, requiring consistent practice with trained therapists. Commitment to this training schedule is often difficult for families. Our project goal is to develop a portable training device, PowerBOT (Figs. 1 & 2), with training guidelines to improve upon the traditional techniques used to train the youngest children with neuromuscular disorders to operate power wheelchairs safely. Our long term goal is to create the device such that it is small and affordable enough to be used for training in the home environment.

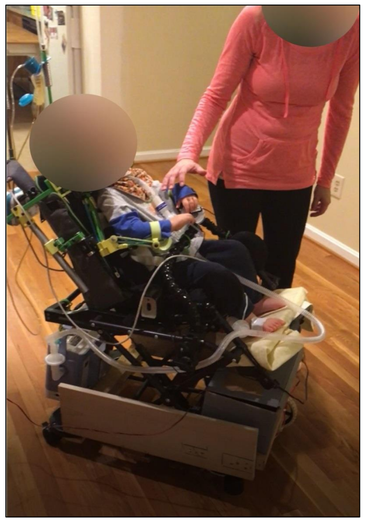


Figure 1: PowerBOT First Prototype with patient

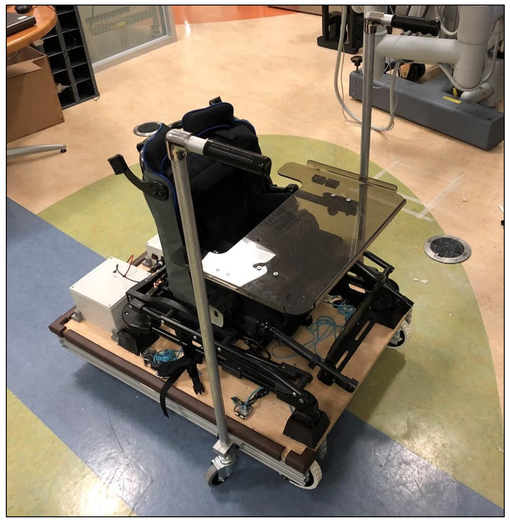


Figure 2: PowerBOT Current Design

Figure 3: Lift Handles

Figure 4: Buddy Button patient layout

Figure 5: Ultra Light Switches

## *Description*

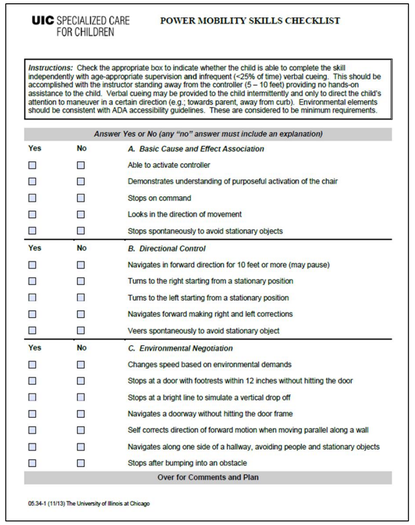
PowerBOT is a 2 foot by 3 foot, 30 pound, motorized platform which can securely accommodate the common Zippie Voyage Booster Base seating system. The Zippie Base is secured using adjustable straps. When compared to previous mobility solutions, such as the Go Baby Go car or the Turtle Training platform, advantages of this system are:

- Portability
  - Adjustable push handles
  - Lift handles (Fig. 3)
- Multidirectional button options
  - Big Buddy Buttons (Fig. 4)
  - Adaptive Switch Lab's Ultra Light switches (Fig. 5)
- Maximal postural support
- Appropriate seat to floor height

Our method of skills evaluation is a previously developed Power Mobility Skills checklist (Fig. 6), developed by the University of Illinois at Chicago. Our first device has been designed and built, and is currently being evaluated under an IRB-approved protocol in physical medicine and rehab clinics at both Children's National Medical Center and The HSC Pediatric Center. Enrolled patients are scheduled for up to 10 training sessions. The end goal of each participant's involvement in our study is to develop adequate power mobility skills to qualify for medical funding for a power wheelchair of their own, based off checklist completion, along with supporting video.

## *Significance*

This device allows us to expand exposure of early power mobility to children who show cognitive signs of readiness, regardless of their medical diagnosis or neurological involvement. Current enrollment is at four patients. Future work is to add proximity sensor capability, and to expand compatible seating options. Further evaluation of patient's ability to use and learn from the device is needed, along with a home-based study, but initial feedback from patients' parents has been positive.



**UIC** SPECIALIZED CARE FOR CHILDREN — **POWER MOBILITY SKILLS CHECKLIST**

*Instructions:* Check the appropriate box to indicate whether the child is able to complete the skill independently with age-appropriate supervision and infrequent (<25% of time) verbal cueing. This should be accomplished with the instructor standing away from the controller (5 – 10 feet) providing no hands-on assistance to the child. Verbal cueing may be provided to the child intermittently and only to direct the child's attention to maneuver in a certain direction (e.g.; towards parent, away from curb). Environmental elements should be consistent with ADA accessibility guidelines. These are considered to be minimum requirements.

*Answer Yes or No (any "no" answer must include an explanation)*

| Yes | No | *A. Basic Cause and Effect Association* |
|---|---|---|
| ☐ | ☐ | Able to activate controller |
| ☐ | ☐ | Demonstrates understanding of purposeful activation of the chair |
| ☐ | ☐ | Stops on command |
| ☐ | ☐ | Looks in the direction of movement |
| ☐ | ☐ | Stops spontaneously to avoid stationary objects |
| **Yes** | **No** | ***B. Directional Control*** |
| ☐ | ☐ | Navigates in forward direction for 10 feet or more (may pause) |
| ☐ | ☐ | Turns to the right starting from a stationary position |
| ☐ | ☐ | Turns to the left starting from a stationary position |
| ☐ | ☐ | Navigates forward making right and left corrections |
| ☐ | ☐ | Veers spontaneously to avoid stationary object |
| **Yes** | **No** | ***C. Environmental Negotiation*** |
| ☐ | ☐ | Changes speed based on environmental demands |
| ☐ | ☐ | Stops at a door with footrests within 12 inches without hitting the door |
| ☐ | ☐ | Stops at a bright line to simulate a vertical drop off |
| ☐ | ☐ | Navigates a doorway without hitting the door frame |
| ☐ | ☐ | Self corrects direction of forward motion when moving parallel along a wall |
| ☐ | ☐ | Navigates along one side of a hallway, avoiding people and stationary objects |
| ☐ | ☐ | Stops after bumping into an obstacle |

Over for Comments and Plan

05.34-1 (11/13) The University of Illinois at Chicago

Figure 6: Power Mobility Skills Checklist

## *Acknowledgements*

Special thanks to the Board of Visitors research grant who made this work possible.

For more information, please contact Tyler Salvador at tsalvador@cnmc.org